

# **INTERMOUNTAIN POWER SERVICE CORPORATION**

**SPECIFICATIONS 45510**

**AND**

**CONTRACT DOCUMENTS 01-45510**

**MATERIALS AND SERVICES FOR HP  
TURBINE RETROFIT UTILIZING THE IPSC LABOR  
FORCE FOR ON-SITE INSTALLATION**

**CONTRACT ISSUED TO:**

**ALSTOM POWER, INC.,  
TURBINE GENERATOR DIVISION  
2800 WATERFORD LAKE DRIVE  
MIDLOTHIAN, VA 23112**

**CONTRACT ADMINISTRATOR: James Nelson**

**Buyer: Ralph Newberry**

CONTRACT AGREEMENT

4/9/01

THIS CONTRACT AGREEMENT, made and entered into this 9th day of April 2001, by and between the **INTERMOUNTAIN POWER SERVICE CORPORATION**, hereinafter called "IPSC," a nonprofit organization under contract to the Intermountain Power Agency (IPA), a political subdivision of the state of Utah, organized and existing under the Interlocal Co-Operation Act, Title 11, Chapter 13, Utah Code Annotated 1953, as amended, and **ALSTOM Power Inc., Turbine Generator Division**, with its principal office in Midlothian, Virginia, hereinafter called ALSTOM or the "Contractor,"

RESOLVES: IPSC has caused to be prepared, specifications and other Contract Documents for **Materials and Services for HP Turbine Retrofit utilizing the IPSC labor force for on-site installation** as herein specified; and

The said Contractor has submitted to IPSC a proposal in accordance with the terms of this Contract Agreement; and

IPSC has determined and declared the aforesaid Contractor to be the best responsible bidder for the said work and has duly awarded to the said Contractor a Contract therefor;

AGREEMENTS: In consideration of the compensation to be paid to the Contractor and of the mutual agreements herein contained, the parties to these presents have agreed and hereby agree, IPSC for itself and its successors, and the Contractor for itself and its permitted successors and assigns, as follows:

ARTICLE I: That the Contractor shall provide as specified and required in accordance with the provisions of the Contract Documents as defined in Article III of this Contract Agreement, and shall provide **Materials and Services for HP Turbine Retrofit utilizing the IPSC labor force for on-site installation** and covered by IPSC's award of this Contract to the said Contractor.

ARTICLE II: The Contractor shall be paid for services and materials embraced in this Contract, and the Contractor shall accept as full compensation therefor, according to the provisions of the Contract Documents as defined in Article III of this Contract Agreement, for all services and materials covered by and included in this Contract, designated in the foregoing Article I; payment to be made in cash or its equivalent in the manner provided in the specifications attached hereto.

**ARTICLE III:** That the term "Contract Documents" means and includes all of the following:

PART	DIV	TITLE
A	A1	Schedule of Pricing
B	B1	Contract Documents
C	C1	General Conditions
	C2	Additional General Conditions
D		Detailed Specifications
	D1	Special Conditions
	D2	Technical Requirements
Appendix 1	Figure 1 - Unit 1, Benchmark Test Heat Balance Figure 2 - Unit 2, Benchmark Test Heat Balance Figure 3 - Unit 1, Operating Heat Balance Figure 4 - Unit 2, Operating Heat Balance Figure 5 - Unit 2, Load Profile Figure 6 - Unit 1, HP Power and Efficiency Figure 7 - Unit 2, HP Power and Efficiency	


In case of conflict or inconsistency, the above listed Contract Documents shall prevail over other information submitted with Contractor's proposal.

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Contract No. 01-45510

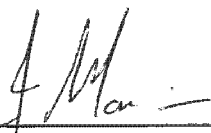
IN WITNESS WHEREOF, the parties hereto have executed this Contract Agreement as of the day and year first above written.

INTERMOUNTAIN POWER SERVICE CORPORATION  
850 West Brush Wellman Road  
Delta, UT 84624-9546

  
\_\_\_\_\_  
S. Gale Chapman  
President and Chief Operations Officer

4-9-01  
\_\_\_\_\_  
Date

ALSTOM Power Inc.  
Turbine Generator Division  
2800 Waterford Lake Drive  
Midlothian, VA 23112

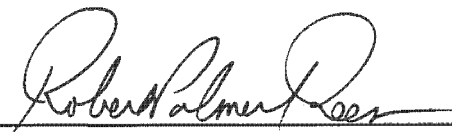
By:   
\_\_\_\_\_  
James Morrison  
Vice President

April 3, 2001  
\_\_\_\_\_  
Date

  
4/2/01

Approved as to form for IPSC:

Fabian & Clendenin  
A Professional Corporation

By:   
\_\_\_\_\_

March 26, 2001  
\_\_\_\_\_  
Date

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**PART A - DIVISION A1****SCHEDULE OF PRICING**

ALSTOM Power Inc., Turbine Generator Division, shall furnish and deliver to IPSC, F.O.B., 850 West Brush Wellman Road, Delta, Ut 84624, in accordance with Specifications 45510, the following: Materials and Services associated with the replacement of the HP Turbine Sections in both units.

**BID TOTALS**

	<u>Unit 2 (2002)</u>	<u>Unit 1 (2003)</u>
Price for Fully Assembled HP Turbine Section:	\$5,050,000	\$4,000,000
Price for Aligned/Partially Disassembled Section:	N/A	N/A
Price for Freight:		
Fully Assembled:	Inc. Above	Inc. Above
Partially Assembled:	N/A	N/A
Contract Cancellation Cost:		
If more than sixteen (16) months before ship:	N/A	10%
Twelve (12) to sixteen (16) months before ship:	10 - 25%	10 - 25%
Ten (10) to twelve (12) months before ship:	25 - 50%	25 - 50%
Six (6) to ten (10) months before ship:	50 - 85%	50 - 85%
If less than six (6) months before ship:	85 - 100%	85 - 100%
Field Service Engineering:	Inc. Above	Inc. Above
(To include all labor, expertise, travel, expenses, and services)		
Field Service Engineering - Unanticipated Work Hours:		
Regular Hours:	\$136/hr	
Ten (10) to sixteen (16) Hrs/day:	\$204/hr	
Holidays:	\$272/hr	
Travel time:	\$At applicable rate	
Expenses/day:	\$180/day	
Turbine Internal Alignment Services:	\$45,000	\$45,000
(To include all labor, expertise, travel, expenses, equipment, and services)		
Guaranteed HP Section Efficiency:	See Division D1, pages D1-4 & 5, Section 8	
(Measured across both valves and HP section)		

## DIVISION A1

## SCHEDULE OF PRICING

Guaranteed HP Section Wheel Power Output: See Division D1, pages D1-4 & 5, Section 8

Labor for Identified Turbine Work Scope:

Assembly/Disassembly: \_\_\_\_\_

Sandblasting: \_\_\_\_\_

Component Repair: \_\_\_\_\_

Other: \_\_\_\_\_

\*Total Budgetary Price:

\$1,210,000

\$1,260,000

Price for Optional Retractable Packing:  
(Packing design must be approved by IPSC  
representative)

\$150,000

\$125,000

Guaranteed Delivery Dates:

March 01, 2002

February 28, 2003

Prices: The price or prices shall be firm \*see above budgetary prices for installation.

Taxes: The foregoing quoted prices are exclusive of all applicable sales and use taxes.

Form of Business Organization: Bidder shall state below the form of its business organization.

Bidder is a Corporation

(Corporation, Partnership, Limited Partnership,  
Individual)

If a partnership, the bidder shall state below the names of the partners. If a corporation, the bidder shall state below the names of the president and of the secretary.

Person to Contact: Should IPSC desire information concerning this Proposal, please contact:

Name Greg Ferrara

Telephone No. (804) 763-7713

Address 2800 Waterford Lake Drive, 5309 Commonwealth Centre, Midlothian, VA 23112

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**PART B - DIVISION B1**

**CONTRACT DOCUMENTS**

The documents listed in the Table of Contents, the reference specifications, any documents listed below, and the bidding documents as expressly agreed to by IPSC and ALSTOM shall constitute the Contract. Said documents are complimentary and require complete and finished Work. Anything shown or required of the parties in any one or more of said documents shall be as binding as if contained in all of said documents.

In event of any conflict between or among the Contract Documents, the following order of precedence shall apply:

1. General Conditions
2. Additional General Conditions
3. Detailed Specifications - Special Conditions
4. Detailed Specifications - Technical Requirements

Preprinted terms, conditions, or other requirements contained on the face or reverse side of any Purchase Order form or other document supplied by either party hereto shall not apply. The parties shall not be allowed to take advantage of any error, discrepancy, omission, or ambiguity in any document, but shall immediately report to the Chief Operations Officer, in writing, any such matter discovered. The Chief Operations Officer will then decide or correct the same and the decision shall be final subject to ALSTOM's right to protest the decision as stated in Division C1, General Conditions, Page C1-9, Section 12, Protests and Claims.

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**PART C - DIVISION C1**

**GENERAL CONDITIONS**


1. **Definitions:** The following words shall have the following meanings:

- a. **Affiliated Company:** A company which directly or indirectly controls, or is controlled by, or is under common control with ALSTOM. At its discretion, ALSTOM may purchase equipment and material from affiliated companies or utilize personnel who are employees of affiliated companies in the provision of Work hereunder, and may subcontract Work to affiliated companies. Affiliated companies shall not however, be under legal obligation to IPSC, IPA, or the Operating Agent in connection with such Work, and IPSC, IPA, and the Operating Agent agree that they will look solely to ALSTOM as the responsible party in connection with all equipment, material, and Work to be furnished hereunder.
- b. **ALSTOM:** ALSTOM Power Inc., Turbine Generator Division, to whom the Contract is awarded.
- c. **Buyer:** The Purchasing Agent for IPSC. (ALSTOM assumes this is Ralph Newberry.)
- d. **Chief Operations Officer:** The President and Chief Operations Officer of IPSC or designated representatives acting within the limits of their authority.
- e. **Contract Administrator:** The IPSC employee designated by the Chief Operations Officer with primary responsibility for administration of the Contract or designated representatives acting within the limits of their authority.
- f. **Contract Price:** The total sum stated in the Contract for which ALSTOM shall be paid by IPSC.
- g. **Contractor:** The person, firm, or corporation to whom the Contract is awarded.
- h. **Directed, Required, Approved, Etc.:** The words *directed, required, approved, permitted, ordered, designated, prescribed, instructed, acceptable, accepted, satisfactory*, or similar words shall refer to actions, expressions, and prerogatives of the Contract Administrator, unless otherwise expressly stated. The Contract Administrator shall exercise such prerogative reasonable and in accordance with the terms of the Contract.
- i. **Gallon:** Liquid volume of 231 cubic inches at 60 degrees Fahrenheit.

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## DIVISION C1

## GENERAL CONDITIONS

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- j. IPA: Intermountain Power Agency, the owner of IPP, and a political subdivision of the state of Utah, organized and existing under the Interlocal Co-operation Act, Title 11, Chapter 13, Utah Code Annotated 1953, as amended.
- k. IPP: Intermountain Power Project, consisting of Intermountain Generating Station, Intermountain Railcar, Intermountain Converter Station, Adelanto Converter Station, Intermountain AC Switchyard and associated transmission lines, microwave stations, and support facilities.
- l. IPSC: Intermountain Power Service Corporation, a nonprofit corporation, furnishing personnel to support the Operating Agent in the performance of operation and maintenance.
- m. Operating Agent: The city of Los Angeles Department of Water and Power (LADWP) which is responsible for operation and maintenance for IPP.
- n. Reference Specifications: Those bulletins, standards, rules, methods of analysis or test, codes, and specifications of other agencies, engineering societies, or industrial associations referred to in these specifications. These refer to the latest edition, including amendments published and in effect at the date of advertising these specifications, unless specifically referred to by edition, volume, or date.
- o. Subcontractor: A person, firm, or corporation, other than ALSTOM and employees thereof, who supplies labor or materials on a portion of the Work.
- p. Ton: The short ton of 2000 pounds.
- q. Work: Materials, labor, and equipment to be furnished under this Contract.
2. Materials and Work: All materials and Work shall comply with these specifications. All materials and equipment furnished shall be new and unused, but this requirement shall not preclude the use of recycled materials in the manufacturing processes. All Work shall be done by qualified workers in a thorough and workmanlike manner. Materials or workmanship not definitely specified, but incidental to and necessary for the Work, shall conform to the best commercial practice for the type of Work in question.
3. Nondiscrimination: The applicable provisions of Executive Order No. 11246 of September 24, 1965, and Bureau of Land Management regulations pertaining to nondiscrimination in employment in the performance of contracts, are incorporated herein by reference, and made a part hereof as if they were fully set forth herein. During the performance of this Contract, ALSTOM shall not discriminate in its employment practices against any employee or applicant for employment because of
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## DIVISION C1

## GENERAL CONDITIONS

the employee's or applicant's race, religion, national origin, color, pregnancy, sex, age, or physical handicap. All subcontracts awarded under any such contract shall contain a like nondiscrimination provision.

4. Governing Law: This Contract shall be governed by the substantive laws of the state of Utah, regardless of rules on the conflict of laws that would cause a court to look to the laws of any other state or laws of any other jurisdiction. Any action, in law or in equity, concerning any alleged breach of or interpretation of this Contract, or concerning any tort in relation to this Contract or incidental to performance under this Contract, shall be filed only in a state or federal court located within the United States of America.
5. Patents: ALSTOM shall fully indemnify and defend IPSC, IPA, and the Operating Agent against any and all liability whatsoever by reason of any alleged infringement of any patent on any article, process, method, or application used in the construction of the Work, or by reason of use by IPSC of any article or material furnished under this Contract. In case of infringement of any third party intellectual property ALSTOM shall, at its own expense, subject to the provisions of this clause, either procure for such indemnified party an irrevocable, royalty-free license to continue using such article, process, method or application, or, provide substantially equal but non-infringing articles or modify such infringing article, process or method of application so that they become non-infringing, provided that no such replacement or modification shall in any way amend or relieve ALSTOM of its warranties and guarantees set forth in this Contract. In the event of any claim being made or action brought against ALSTOM arising out of matters referred to in this clause, ALSTOM shall be promptly notified and may at ALSTOM's own expense conduct all negotiations for the settlement of the same and any litigation that may arise therefrom.
6. ALSTOM's Address and Legal Service: The address given in the Proposal shall be considered the legal address of ALSTOM and shall be changed only by written notice to IPSC. ALSTOM shall supply an address to which certified mail can be delivered. The delivery of any communication to ALSTOM personally, or to such address, or the depositing in the United States Mail, registered or certified with postage prepaid, addressed to ALSTOM at such address, shall constitute a legal service thereof.
7. Assignment of Contract Prohibited: Neither party shall assign or otherwise attempt to dispose of this Contract, or of any of the monies due or to become due thereunder, unless authorized by the prior written consent of the Chief Operations Officer and ALSTOM, such authorization not to be unreasonably withheld. No right can be asserted against IPSC, IPA, or the Operating Agent, in law or equity, by reason of any assignment or disposition unless so authorized.

If either party, without such prior written consent, purports to assign or dispose of the Contract or of any interest therein, the other party, at its option, may terminate the Contract, and shall be relieved and discharged from any and all liability and obligations to the party in non-compliance with the requirements hereof, and to any assignee or

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transferee thereof. Such termination shall not waive or relieve either party's obligations to make payments due hereunder for Work performed.

Notwithstanding anything to the contrary in this Contract, ALSTOM may assign any amounts due to it under this Contract to a special purpose account as part of its participation in an Asset Backed Securitization Program without notice to or the consent or approval of the other party hereto. No such assignment by ALSTOM shall constitute an event allowing for termination of this Contract. No such assignment by ALSTOM shall reduce, change, or modify any right of IPSC under this Contract.

8. Quality Assurance: All materials or equipment furnished and delivered under the Contract will be subject to rigorous inspection by the Contract Administrator. Before offering any material or equipment for inspection or testing, ALSTOM shall eliminate all items which are defective or do not meet the requirements of the specifications. If any items or articles are found not to meet the requirements of the specifications, the lot, or any faulty portion thereof, may be rejected. The fact that the materials or equipment have been inspected, tested, or accepted by the Contract Administrator shall not relieve ALSTOM of responsibility in case of later discovery of flaws or defects.

Notwithstanding the above, the ALSTOM Affiliated Company manufacturing the equipment ("ALSTOM MANUFACTURER") shall implement a quality assurance program addressing all phases of design, manufacture, installation, and startup of the HP turbine section. The purpose of the HP section Q/A program is to ensure that:

- a. Design documents, drawings, specifications, quality assurance procedures, inspections procedures, and purchase documents are maintained current, accurate, and under control.
- b. The purchased materials, equipment, and services conform to the requirements of these documents.
- c. Receipt inspections, in-process inspections, examination, and testing are complete and appropriate.
- d. Subcontracted Work is adequately inspected and monitored.
- e. Special processes such as welding, heat treating, hot forming, and NDE are of adequate quality.
- f. Welders and NDE personnel are adequately qualified.
- g. Nonconforming equipment and materials are properly documented, controlled, and dispositioned.



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IPSC shall have full access, at all times, to the quality assurance procedures, instructions, and nonconforming reports applicable to the equipment and materials furnished under this Contract.

As part of the quality assurance program, the ALSTOM Manufacturer shall provide updated information to IPSC, as needed, regarding the manufacturing locations of each major component, all tests to be performed on each component and assembly, and shall list the individuals with respective phone numbers who will be in charge of quality verification at each site.

The ALSTOM Manufacturer is certified by Lloyds Register Quality Assurance as having a Quality Assurance System which is compliant with the requirements of BS EN ISO 9001:1994. ALSTOM shall ensure that the ALSTOM Manufacturer, at all times during the term of this Contract, maintain ISO 9001 Certification. (For clarification it should be noted that within ALSTOM Power Inc. there are Divisions and Product lines that have individually achieved ISO certification. Where such organizations may be utilized in the performance of services or products to be provided hereunder, they shall be produced in full compliance with such certifications.)

This section explains briefly (1) how the ALSTOM Manufacturer's various systems relate to each other, and (2) how customer contract specific requirements are identified and fulfilled.

- a. Quality System: The overall company quality system is controlled by the Company Quality Assurance Manual. This shows how the quality management system is organized to comply with the ISO 9001 requirements, section by section.
  - (1) In order to ensure compliance with the requirements of the Quality Assurance Manual, there are documented General Quality Procedures for each aspect of the business, covering the Commercial, Design, Manufacturing Construction, etc., functions. These General Procedures set the framework within which each local department must operate.
  - (2) Each local department operates to a series of Detailed Application Procedures. These describe, in detail, the ways in which Quality-related tasks are carried out in the department.

Each of the three (3) interrelated levels described above is written with the objective of ensuring strict compliance with the ISO 9001 Quality objectives. The Company is regularly audited by internal audit teams and independent external auditors.



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- b. **Quality Definition:** The scope of a contract is identified in a number of elements which together define the product. Such elements may consist of, but not be limited to:
- Drawings
  - Specifications
  - Technical Instructions
  - Work Instructions
  - Purchase Orders
  - Subcontracts
  - Quality Control Plans (PQR's)
  - Quality Control Operations Submitted to Customer (AQSC's)
- c. **Quality Control:** At each stage of "Production" (which can, of course, include the Conceptual Design and the Drawing Office functions, for example) a range of Quality Assurance elements support the end product. These elements consist of, but are not limited to:
- Self Inspection Records
  - Independent Inspection Records
  - Personnel Qualification
  - Procedure Qualification
  - Equipment Qualification
  - Measuring, Inspection, and Test Equipment Calibration
  - Raising and Resolution of Nonconformity Reports
  - Contract Quality Control Plan (PQR) Requirements
- d. **The Quality Control Plans:** The ALSTOM Manufacturer draws up the Quality Control Plans for equipment supply. These provide the framework against which quality activities are identified and monitored. The relevant documentation, activities, and specifications are identified on the PQR's, and completion of activities is formally recorded on the PQR's. The type of Quality Assurance task is defined for each line of the PQR, viz.:
- V = Verification of a Quality Status**  
(For example, that NDE operators are qualified to carry out the designated procedure)
- R = Report Required**  
(For example, the results of a chemical analysis)



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**N = Notification Point**

(For example, that a test is due to take place shortly, e.g., ultrasonic examination) This gives the notified company the opportunity to attend or waive attendance. In either case, reports are issued.

**H = Hold Point**

Notification Point, but Work may not continue until formal release to proceed is given by the notified company.

- e. Quality Control Operations Submitted to the Customer (AQSC's): Each of the PQR's which the ALSTOM Manufacturer uses to control the product quality, has space on the form for the identification of customer involvement. This can be any of the three (3) definitions R, N, or H described above. In practice, client involvement is normally for the provision of documentary records, together with some Notification Points (for example, to enable the customer to attend the high-speed balance and over-speed testing of a rotor).

For manufacture, all the customer requirements are collated onto the AQSC, which not only forms a convenient summary, but also acts as the "Index" for the dossier of all the quality documentation which is submitted to the customer at the end of the contract (End of Manufacture Report).

Records of turbine assembly (i.e., shop build) are collated in a separate dossier which is made available to ALSTOM Technical Service Engineers, and to IPSC. This dossier contains records of all the "design" and "actual" dimensions and clearances necessary to install the unit on a site.

- f. The enclosed Summary of Quality Control Actions identifies each quality control point and the respective required action.

9. Extra Work or Changes by IPSC: IPSC reserves the right at any time, before final acceptance of the entire Work, to request ALSTOM to perform extra Work, furnish extra material or equipment, or to make changes altering, adding to, or deducting from the Work, without invalidating the Contract. Changes shall not be binding upon either IPSC or ALSTOM unless made in writing in accordance with this Article.

Changes will originate with the Chief Operations Officer who will transmit to ALSTOM a written request for a Proposal covering the requested change, setting forth the Work in detail, and including any required supplemental plans or specifications. Upon receipt of such request, ALSTOM shall promptly submit in writing to the Chief Operations Officer a Proposal offering to perform such change, a request for any required extension of time caused by such change, and an itemized statement of the cost or credit for the proposed change. Failure of ALSTOM to include a request for extension of time in the



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Proposal shall constitute conclusive evidence that such extra Work or revisions will entail no delay and that no extension of time will be required.

If ALSTOM's Proposal is accepted by IPSC, a written change order will be issued by the Chief Operations Officer stating that the extra Work or change is authorized and granting any required adjustments of Contract price and of time of completion. The performance of extra Work or changes pursuant to change order shall be in accordance with the terms and conditions of these specifications. No extra Work shall be performed or change made unless pursuant to such written change order, and no claim for an addition to the Contract price shall be valid unless so ordered.

10. Changes to Facilitate Work at Request of ALSTOM: Changes may be made to facilitate the Work of ALSTOM. If ALSTOM requests a change for reasons other than as a result of changed or unknown conditions or delays due to Work of IPSC or others under IPSC's control, then such changes may only be made without additional cost to IPSC and without extension of time. Permission for such changes shall be requested in writing by ALSTOM to the Chief Operations Officer. If changes are required by ALSTOM as a result of changed or unknown conditions or delays due to Work of IPSC or others under IPSC's control, ALSTOM shall promptly advise IPSC of such need for change and the parties shall agree upon an equitable adjustment in price and schedule as may be necessary to overcome the effect of such change.
11. Schedule and Extensions of Time: Delivery shall be completed within the times and by the dates specified. Time for delivery shall not be extended except as provided in this Section and Detailed Specification – Special Conditions, Section 9, Force Majeure.

If ALSTOM makes a timely written request in accordance with this Section, the time for delivery and price for the Work will be extended/increased as necessary to overcome the effect of such delay of the Work which is: (1) authorized in writing by the Chief Operations Officer, or (2) to the extent caused by IPSC or others under its control, or (3) due to unforeseeable causes (such as war, strikes, or natural disasters) and which delay is beyond the control and without the fault or negligence of ALSTOM and subcontractors.

ALSTOM shall promptly notify the Chief Operations Officer in writing when ALSTOM could have been reasonably expected to recognize that such delay has occurred, of its cause, its effect on the whole Work, and the extension of time and, to the extent a delay is attributable to IPSC, IPA, or the Operating Agent or others under its control, the increase in price claimed. Failure of ALSTOM to provide such written notices prior to final payment and to show such facts shall constitute conclusive evidence that no excusable delay has occurred and that no extension of time is/was required. The Chief Operations Officer will ascertain the facts and the extent of the delay and will extend the time for delivery when the findings of fact justify such an extension. The Chief

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Operations Officer's determination will be final subject to ALSTOM's right to protest the decision as stated in Division C1, General Conditions, Page C1-9, Section 12, Protests and Claims.

In the event of a delay in delivery which is attributable to the fault of ALSTOM (which for the avoidance of doubt shall include delay attributable to ALSTOM's subcontractors and subsuppliers), ALSTOM shall pay liquidated damages to IPSC in accordance with the liquidated damages provided by Division D1, Special Conditions, Page D1-4, Section 8. Liquidated damages payable under the Contract shall be paid by ALSTOM in full and final satisfaction of ALSTOM's liability and as IPSC's, IPA's, and the Operating Agent's sole remedy for the act or default for which they are payable.

12. Protests and Claims: If ALSTOM considers any demand of the Chief Operations Officer to be outside of the requirements of the Contract, or considers any amount of payment, or any record, ruling, or other act or omission by the Chief Operations Officer to be unreasonable, ALSTOM shall promptly deliver to the Chief Operations Officer a written statement of the protest and of the amount of compensation claimed.

Upon written request by the Chief Operations Officer, ALSTOM shall provide supporting documentation and records of evidence relating to the claim or protest.

Upon review of the protest, claim, and evidence, the Chief Operations Officer will promptly advise ALSTOM in writing of the final decision which will be binding on all parties subject to ALSTOM's right to seek remedy in courts having jurisdiction over this Contract, provided that ALSTOM shall have advised IPSC of its intent to seek such legal remedy within thirty (30) days of any such final decision by the Chief Operations Officer on behalf of IPSC.

13. Limitation of Liability: It is understood and agreed that the Intermountain Power Agency will be the party solely liable to ALSTOM for payments under this Contract and for any breaches, defaults, or for any torts in the performance of this Contract by IPA or the Operating Agent or IPSC or any officers, agents, or employees thereof, and ALSTOM hereby expressly covenants and agrees that no suit shall be brought by ALSTOM against the Operating Agent or IPSC or their officers, agents, or employees or any of the purchasers of power from IPA, but that all rights or remedies that ALSTOM may have or that may arise shall be asserted by ALSTOM solely against IPA.

Except for ALSTOM's obligations under Division D1, Special Conditions, Page D1-1, Section 3, Indemnity, ALSTOM's and affiliated companies' aggregate liability to IPA, IPSC, and Operating Agent on all claims of any kind, whether based on Contract warranty, tort (including negligence), strict liability, or otherwise, for all losses or damages arising out of, connected with or resulting from, this Contract, its performance or breach (including indemnity, warranty, and any liquidated damages) shall not exceed

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the Contract price. No action, regardless of form, arising out of the transactions under this Contract, may be brought by IPA, IPSC, or the Operating Agent more than one (1) year after discovery.

IN NO EVENT, WHETHER AS A RESULT OF BREACH OF CONTRACT, INDEMNITY, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY, PROFESSIONAL LIABILITY, PRODUCTS LIABILITY, CONTRIBUTION OR OTHERWISE, SHALL ALSTOM OR AFFILIATED COMPANIES BE LIABLE TO IPSC, IPA, OR THE OPERATING AGENT FOR INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHETHER IN OR ON ACCOUNT OF FAILURE OF REMEDY OR OTHERWISE INCLUDING BUT NOT LIMITED TO: LOSS OF PROFITS OR REVENUE; LOSS OF DATA; LOSS OF USE OF EQUIPMENT OR TECHNOLOGY; DAMAGE TO OTHER TANGIBLE PROPERTY OF IPSC, IPA, OR THE OPERATING AGENT; COST OF CAPITAL; COST OF SUBSTITUTE EQUIPMENT, SERVICES, OR FACILITIES; DOWNTIME COSTS; COST OF REPLACEMENT STEAM OR ELECTRIC POWER OR CLAIMS OF CUSTOMERS OR THIRD PARTIES FOR SERVICE INTERRUPTIONS; DELAYS OR CLAIMS OF CUSTOMERS OR THIRD PARTIES FOR SUCH DAMAGES, PROVIDED THAT FOR PURPOSES OF THIS CLAUSE, DIRECT DAMAGES TO IPSC'S, IPA'S, OR THE OPERATING AGENT'S PROPERTY CAUSED BY ALSTOM'S NEGLIGENCE OR AS A RESULT OF PRODUCT LIABILITY SHALL NOT BE CONSTRUED AS INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Subject to ALSTOM's limitation of liability as set forth above, ALSTOM shall at all times, take adequate precautions to protect IPA, IPSC, and the Operating Agent's property. ALSTOM shall, at its option and taking into account IPSC's need to operate, repair, replace or reimburse IPA, IPSC, and the Operating Agent for any damage to equipment or property of IPA, IPSC, and the Operating Agent to the extent arising out of ALSTOM's negligent acts or omissions or that may arise as a result of ALSTOM's product liability.

The limitation of ALSTOM's liability and exclusion of indirect, special, incidental, or consequential damages, as provided for in paragraphs above, shall prevail over any conflicting or inconsistent provisions contained in any of the documents comprising this Contract.

14. Independent Contractor: ALSTOM shall perform said services as an independent contractor in the pursuit of its independent calling, is not an employee, agent, joint venturer, partner, or other representative of IPSC or the Operating Agent, and shall be under the control of IPSC only to provide the services requested and not as to the means or manner by which the Work is to be accomplished. ALSTOM has no authority to act for, bind, or legally commit IPA, IPSC, or the Operating Agent in any way.

## DIVISION C1

## GENERAL CONDITIONS

15. Termination : If ALSTOM becomes insolvent, or a petition for a winding-up order should be filed against ALSTOM, or if ALSTOM should make a general assignment for the benefit of creditors, or if a receiver should be appointed due to the insolvency of ALSTOM, or if ALSTOM should otherwise violate any material provisions of the Contract and fails to initiate a cure for such violation within a reasonable period of time (in no event less than 20 days) and reasonably continue to progress in said cure, after receiving a notice in writing from IPSC specifying the violation and the need for cure, then IPSC, after giving ALSTOM seven (7) days' written notice, may terminate the Contract in whole or in part. In the event of such a termination, IPSC may use all or part of ALSTOM's equipment and materials which are on the Work site and may finish the Work by whatever method IPSC may deem expedient. (In such event, ALSTOM will not be entitled to receive any further payment hereunder until the Work is finished.)

Any sums reasonably incurred by IPSC in completing the Work itself or by another contractor, in excess to the Contract Price, shall be paid by ALSTOM to IPSC. If the unpaid balance of the Contract Price exceeds the expense of finishing the Work, such excess shall be paid to ALSTOM.

For the avoidance of doubt, IPSC shall not be entitled to terminate the Contract for any act or default for which liquidated damages are provided as the applicable remedy under the Contract.

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PART C - DIVISION C2

ADDITIONAL GENERAL CONDITIONS

1. Warranty: ALSTOM warrants that all Work shall be (1) suitable for use as an HP Turbine in the electrical generating unit in the plant for which it is intended; (2) free of nonconformities in material and workmanship and performed in a good and workmanlike manner; and (3) shall conform to requirements of this Contract. These warranties shall extend for twenty-four (24) months after initial electrical synchronization of the Work or thirty-six (36) months following delivery of the Work, whichever period shall expire first (the "Warranty Period").

Due to operational priorities, access to turbine components for warranty adjustments shall be at the discretion of IPSC.

IPSC will retain the right to operate the components and equipment provided under these specifications regardless of any outstanding warranty issues. ALSTOM shall be released from any additional claims for damage incurred as direct result of such continued operation. Warranty obligations for defects not attributable to such continued operation shall remain the responsibility of ALSTOM.

ALSTOM shall provide a schedule identifying any maintenance procedures or testing/inspection required to maintain these warranty provisions.

Should any failure to conform with the applicable warranties appear during the specified periods, ALSTOM shall correct such nonconformity, at its option, by repair, reperformance, or replacement of the nonconforming Work F.O.B. Contract delivery point. If such correction is impractical or impossible, ALSTOM shall refund the purchase price of the nonconforming Work. Notification of alleged warranty nonconformities shall be made promptly upon discovery, but in no event later than thirty (30) days after expiration of the warranty period. Repairs, reperformance, or replacements pursuant to warranty shall not renew or extend the applicable warranty period on the entire Work, provided however, that any such repairs, reperformance, or replacement of any individual component of the Work shall be warranted for twenty-four (24) months from completion of its correction/repair. In no event shall any warranty period, including extension thereto applicable to any component of Work, extend for more than (1) fifty-four (54) months from delivery; or (2) forty-eight (48) months from initial electrical synchronization of the Work, whichever period shall expire first. ALSTOM may, at its option, substitute improved products when replacing any part.

These warranties shall not apply to any Work which (1) has been improperly repaired or altered (other than by ALSTOM); (2) has been subjected to misuse, negligence, or accident; (3) has been installed, commissioned, and used in a manner contrary to ALSTOM's instructions; (4) is comprised of materials provided or design stipulated by IPSC; (5) is used equipment; or (6) has been damaged by or subjected to abrasion, corrosion, chemical attack, poor steam chemistry control, or other conditions outside of good North American operating practice for similar equipment.

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## DIVISION C2

## ADDITIONAL GENERAL CONDITIONS

Correction of nonconformities or refunds of the amounts paid in the manner and for the time provided above, shall be IPSC's exclusive remedy and shall constitute fulfillment of all liabilities of ALSTOM and its subcontractors and affiliates (including any liability for direct, indirect, special, incidental, or consequential damage) whether in warranty, contract, negligence, tort, strict liability, or otherwise with respect to any nonconformance of or nonconformity or deficiency in the Work supplied.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE AND RESULTS, WRITTEN, ORAL, OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY WARRANTY OR RESULTS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED BY ALSTOM AND ALL EQUIPMENT MANUFACTURERS.

2. Payment: Payment will be made within thirty (30) calendar days after delivery and receipt of the invoice. Payment shall occur as specified within the bid payment schedule submitted and identified in this Division, Page C2-2, Section 3, Supply and Installation of Equipment on a Fixed Price Basis.

Overdue payments are subject to a late charge, calculated from the date of invoice to the date of payment, equal to the lesser of 1.5 percent per month or the highest applicable rate allowed by law.

In the event IPSC fails to make any payment within thirty (30) calendar days of the date of any invoice becoming due and payable, ALSTOM shall be entitled to give written notice to IPSC requiring payment. If IPSC fails, without valid cause under the terms of the Contract, to make payment within fourteen (14) calendar days of receipt of such notice, then ALSTOM shall be entitled to suspend performance of the Work and to obtain an extension of time and costs as a result of such.

Progress payments will be made in accordance with the payment schedule detailed in Section 3 below. IPSC will make payments by wire transfer within thirty (30) days after receipt of invoice or achievement of the applicable payment extent specified.

3. Supply and Installation of Equipment on a Fixed Price Basis: ALSTOM proposes that the following payment points shall apply to the HP Turbine Replacement Contract.
- a. First Payment: Twenty (20) percent of each unit contract price payable within one (1) month of ordering the HP rotor forging.
  - b. Second Payment: Further twenty (20) percent of each unit contract price payable within one (1) month of certification of commencement of rotor machining.

## DIVISION C2

## ADDITIONAL GENERAL CONDITIONS

- c. Third Payment: Further twenty (20) percent of each unit contract price payable within one (1) month of certification of completion of fitting blades to the rotor.
  - d. Fourth Payment: Further twenty (20) percent of each unit contract price payable within one (1) month of certification of completion of rotor balancing and trial build.
  - e. Fifth Payment: Ten (10) percent of each unit contract value payable within one (1) month of receipt of the equipment at the Intermountain plant.
  - f. Sixth Payment: Ten (10) percent of each unit contract price payable within two (2) months of initial resynchronization of the unit following retrofit installation.
4. Taxes: ALSTOM prices do not include any federal, state or local property, privilege, sales, service, use, excise, value added, or other like taxes which may now or hereafter be applicable to, measured by, or imposed upon or with respect to this transaction, the property, its purchase, sale, replacement value or use, or any services performed in connection therewith. IPSC agrees to pay or reimburse ALSTOM, its subcontractors or suppliers, for any such taxes which ALSTOM, its subcontractors or suppliers are required to pay, collect, or withhold. Such taxes shall be shown as a separate line item on ALSTOM's invoices.
- Notwithstanding the above, ALSTOM shall arrange for goods to clear customs formalities and pay customs duties and charges in accordance with the delivery term DDP Jobsite (as specified by Incoterms 1990).
- Transfer of title to goods shall pass upon delivery to the IPSC job site.
5. Regulations, Permits, Licenses, and Warrants: ALSTOM shall comply with all applicable federal, state, and local laws and regulations including, but not limited to, Federal and State OSHA, as said regulations relate to this Contract. In addition, ALSTOM shall ensure that all permits, licenses, and warrants required in ALSTOM's name and relating to the Contract be acquired.

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DIVISION C2

ADDITIONAL GENERAL CONDITIONS

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6. Letters to IPSC: All letters pertaining to performance of the Contract shall be addressed as follows:

S. Gale Chapman  
President and Chief Operations Officer  
Intermountain Power Service Corporation  
850 West Brush Wellman Road  
Delta, UT 84624-9546

Attention: Contract Administrator

Regarding Contract No. 01-45510

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PART D - DIVISION D1

DETAILED SPECIFICATIONS - SPECIAL CONDITIONS

1. Printed Documents: All printed documents including drawings and instruction books, if applicable, shall be in the English language. All units of measurement shall be in the English foot-pound-second system.
2. Delivery Arrangements: After date of award of Contract and prior to delivery, ALSTOM shall familiarize itself with the unloading facilities at the delivery point set forth in the Proposal Schedule, either by personal inspection or by contacting the Contract Administrator at (435) 864-4414.
3. Indemnity: To the extent of its negligence, ALSTOM undertakes and agrees to indemnify, hold harmless, and at the option of the Intermountain Power Agency, defend Intermountain Power Agency, Intermountain Power Service Corporation, Los Angeles Department of Water and Power, and any and all of their boards, officers, employees, assigns and successors in interest (to the extent that ALSTOM has agreed to such assigns and successors in accordance with the provisions of this Contract) (hereinafter "Indemnified Parties") from and against any and all suits and causes of action, claims, charges, costs, damages, demands, expenses (including, but not limited to, attorneys' fees and cost of litigation), judgments, civil fines and penalties, liabilities or losses, related to violation of laws and regulations, the death, bodily injury or personal injury to any person, including ALSTOM's employees and agents, or damage or destruction, to any third party tangible property in any manner arising by reason of or incident to the performance of this Contract on the part of ALSTOM or ALSTOM's officers, agents, employees, or subcontractors of any tier. The obligation of ALSTOM to indemnify Indemnified Parties is conditioned on the Indemnified Parties giving ALSTOM prompt notice of any loss, damage, or claim, and providing ALSTOM a full opportunity to takeover, defend, and approve any settlement thereof.

It is the intent of the parties hereto that, where fault, acts, or omissions are determined to be contributory, principles of comparative negligence will be followed and each party shall bear the proportionate cost of any loss, damage, expense, and liability attributable to that party's negligent acts or omissions.

4. Insurance Requirements: Prior to the start of Work, ALSTOM shall furnish IPSC evidence of coverage from insurers authorized to do business in the state in which Work will be performed. Such insurance shall be maintained by ALSTOM at ALSTOM's sole cost and expense.

Should any portion of the required insurance be on a "Claims Made" policy, ALSTOM shall, at the policy expiration date following completion of Work, provide evidence that the "Claims Made" policy has been renewed or replaced with the same limits, terms and

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## DIVISION D1

## SPECIAL CONDITIONS

conditions of the expiring policy, or that an extended discovery period has been purchased on the expiring policy at least for the Contract under which the Work was performed.

a. Workers' Compensation/Employer's Liability

Workers' Compensation Insurance covering all of the Contractor's employees in accordance with the laws of any state in which the Work is to be performed and including Employer's Liability Insurance, and as appropriate, Broad Form All States Endorsement, Voluntary Compensation, Longshoremen's and Harbor Workers' Compensation, Jones Act, and Outer-Continental Shelf coverages. The limit for Employer's Liability coverage shall be \$1 million each accident and shall be a separate policy if not included with Workers' Compensation coverage. Evidence of such insurance shall be in a form acceptable to IPSC and shall provide for a thirty (30) day prior written notice of cancellation or nonrenewal of a continuous policy to IPSC, by receipted delivery, and a Waiver of Subrogation in favor of IPSC, IPA, and LADWP, its officers, agents, and employees with regard to Workers' Compensation/Employer's Liability only. Workers' Compensation/Employer's Liability exposure may be self-insured provided that IPSC is furnished with a copy of the certificate issued by the state authorizing the Contractor to self-insure. Contractor shall notify IPSC by receipted delivery as soon as possible of the state withdrawing authority to self-insure.

b. Comprehensive General Liability

Comprehensive General Liability with Blanket Contractual Liability, Products and Completed Operations, Broad Form Property Damage, Premises and Operations, Independent Contractors, and Personal Injury coverages included. Such insurance shall provide coverage of \$10 million Combined Single Limit per occurrence and in the aggregate. Umbrella or Excess Liability coverages may be used to supplement primary coverages to meet the required limits. Evidence of such coverages shall be in a form acceptable to IPSC and provide for the following:

- (1) To include IPA, IPSC, LADWP, and their officers, agents, and employees as additional insured with the Named Insured to the extent of ALSTOM's indemnity obligations assumed under the Contract.
- (2) That the insurance is primary and not contributing with any other insurance maintained by IPSC, IPA, or the Operating Agent.



## DIVISION D1

## SPECIAL CONDITIONS

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- (3) A Severability-of-Interest of Cross-Liability Clause such as: "The policy to which this endorsement is attached shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the limits of the company's liability."
- (4) That the policy shall not be subject to cancellation, change in coverage, reduction of limits or nonrenewal of a continuous policy, except after written notice to IPSC by receipted delivery, not less than thirty (30) days prior to the effective date thereof.
- c. Comprehensive Automobile Liability
- Comprehensive Automobile Liability covering the use of owned, nonowned, hired, and leased vehicles for limits of \$1 million Combined Single Limit per occurrence and in the aggregate. Such insurance shall include Contractual Liability coverage. Policy provisions for additional insureds, primary insurance, Severability-of-Interest, and cancellation shall be the same as described in the Comprehensive General Liability Section. The Comprehensive Automobile Liability coverage may be included with the Comprehensive General Liability coverage.
- d. Transportation Floater
- ALSTOM shall provide evidence of transport insurance covering the full replacement value of the Work during all phases of transportation between its factories and the IPSC Plant site.
- e. Other Conditions
- (1) Failure to maintain and provide acceptable evidence of the required insurance for the required period of coverage shall constitute a major breach of Contract, upon which IPSC may immediately terminate or suspend the Contract, or at its option, procure such insurance and submit a claim against ALSTOM, deduct the cost thereof, including an administrative charge of two (2) percent, from any monies due ALSTOM, or shall be immediately reimbursed by ALSTOM for such costs upon demand.
- (2) ALSTOM shall be responsible for all subcontractor's compliance with these insurance requirements.
5. Transportation: All shipments of hazardous materials under this Contract shall be handled in accordance with federal, state, and local regulations to include current U.S. Department of Transportation regulations.

## DIVISION D1

## SPECIAL CONDITIONS

6. Safety: ALSTOM agrees that it is familiar with the risks of injury associated with the Work, has reviewed the Work to be performed and the job site with an IPSC representative, and determined that no unusual or peculiar risk of harm exists with regard to the Work to be performed at the job site.
7. Material Safety Data Sheets: ALSTOM shall furnish a Material Safety Data Sheet (MSDS) for all hazardous materials furnished under this Contract. The MSDS shall be furnished to IPSC on, or prior to, the date of the first delivery of the materials or equipment.

If the specifications require that ALSTOM furnish instruction books, the MSDS's shall also be included in such books.

8. Liquidated Damages/Incentives: In the event ALSTOM fails to complete performance of its obligations by the date specified in this Section and such delay is attributable to ALSTOM and not due to a fault of IPSC or others under IPSC's control nor to reasons beyond ALSTOM's reasonable control (i.e., Force Majeure Events), then ALSTOM shall pay to IPSC liquidated damages in accordance with this Section, up to the liquidated damages limit of liability specified in Section 13 of this Division.

ALSTOM guarantees the performance of the Work when tested in accordance with the conditions specified in this Section. Performance testing shall be conducted as soon as practicable after initial synchronization, but not later than eight (8) weeks after initial electrical synchronization. Degradation allowances shall be applied in accordance with Division D2, Technical Requirements, Page D2-9, Section 14. In the event of a shortfall in achievement of such performance guarantees, when the Work is tested by IPSC in accordance with the Proposal, and such shortfall is attributable to ALSTOM and not due to a fault of IPSC or others under IPSC's control and not due to reasons beyond ALSTOM's reasonable control, then ALSTOM shall pay to IPSC liquidated damages in accordance with this Section up to the aggregate liquidated damages limit of liability specified therein.

Prior to paying liquidated damages for shortfall in performance, ALSTOM shall be entitled to a reasonable opportunity to adjust the Work and to have it retested. The measured performance of the Work shall be adjusted to account for deviations from the testing conditions specified in the Proposal before calculating ALSTOM's liquidated damages liability and any discrepancy between the measured performance and guaranteed performance shall be reduced by the applicable testing tolerance.

The payment of liquidated damages by ALSTOM to IPSC under the Contract shall be IPSC's sole remedy in full and final satisfaction of ALSTOM's liability for any delay or shortfall in guaranteed performance of the Work.



## DIVISION D1

## SPECIAL CONDITIONS

*Penalty*

For each complete 0.1 percent shortfall in HP section efficiency below 92.2 percent (corrected for actual operating conditions), ALSTOM will pay \$75,000 (this value equates to slightly over \$250,000 per MW shortfall caused by efficiency shortfall). A testing tolerance equal to the mutually agreed measurement uncertainty shall be applied to a measured HP efficiency (corrected for actual operating conditions) taking into full consideration all test instrumentation prior to assessing liquidated damages.

*Incentive*

ALSTOM shall be awarded a cash incentive of \$15,000 for each complete 0.1 percent in performance that is confirmed by the performance test results above 92.2 percent (corrected for actual operating conditions), up to a maximum performance cash incentive of \$200,000. No testing tolerance shall be applied above 92.2 percent (corrected for actual operating conditions), prior to calculating the performance incentive.

*Penalty*

For each complete 0.1 percent main steam flow in excess of 6.975 Mlb/h ALSTOM will pay \$15,000. (This value is derived on the basis that the power loss due to operation at reduced pressure if the turbine is made oversized by 0.1 percent is only one-fifth of the power loss due to flow restriction if the turbine is made undersized by the same amount). ?

- a. Delivery Schedule and Incentives: For delivery after March 1, 2002 for Unit 2 or after February 28, 2003 for Unit 1, liquidated damages of \$200,000 will be applied.

For delivery of the HP section to the site two (2) weeks ahead of the outage start dates identified above, ALSTOM will be allowed to avoid one (1) day of penalty in completion of the installation, for any delay attributable to ALSTOM prior to any penalty being assessed. This means that with delivery two (2) weeks ahead of the scheduled outage date, the maximum outage extension penalty will be reduced to \$900,000 and will not begin accumulating until one (1) day past the installation schedule identified within the bid.

- b. Installation Schedule and Incentives: IPSC is responsible for performing the installation Work and nothing in the Purchase Order shall be construed to create a liability of the Seller for the Work rate or quality of Work performed by the labor force responsible for installing the Goods. However, in the event of a delay in the scheduled installation duration of the Goods which is demonstrably attributable to:

A defect in design, manufacture, or workmanship of the Goods and, provided IPSC has promptly notified ALSTOM in writing and diligently implemented ALSTOM's recommendations to overcome such delay, then ALSTOM shall pay

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## DIVISION D1

## SPECIAL CONDITIONS

liquidated damages for delay in scheduled installation duration of the Goods in accordance with the following:

For each day that the outage length is extended, beyond that detailed in the attached "28-day Outage Schedule," ALSTOM shall pay liquidated damages of \$100,000. The maximum liquidated damages for outage extension shall be ten (10) days or \$1,000,000.

For each complete MW shortfall (and pro rata for each portion thereof) in HP shaft power (corrected for actual operating conditions) below the guaranteed figure, attributed to shortfall in flow below 6.9 Mlb/h, ALSTOM shall pay \$250,000. A testing tolerance equal to the mutually agreed measurement uncertainty shall be applied to the measured HP shaft power (corrected for actual operating conditions), taking into full consideration the calibration and inspection status of the feedwater flow nozzle and other test instrumentation prior to assessing liquidated damages.

Should IPSC decide to substitute the HP shaft power guarantee with an HP swallowing capacity guarantee, then for each complete 0.1 percent main steam flow shortfall below 6.9 Mlb/h (corrected for actual operating conditions) ALSTOM shall pay \$75,000. A testing tolerance equal to the mutually agreed measurement uncertainty shall be applied to the measured HP capacity (corrected for actual operating conditions), taking into full consideration the calibration and inspection status of the feedwater flow nozzle and other test instrumentation prior to assessing liquidated damages.

If the turbine section is delivered late and IPSC elects to proceed with installation of the new HP turbine, no outage extension penalty shall be assessed unless and until the ALSTOM's bid installation schedule is exceeded.

9. Force Majeure: ALSTOM shall be entitled to an equitable extension of time in the event of a delay beyond its reasonable control (including without limitation acts of God, civil insurrection, acts of government or governmental agencies, trade embargo, strikes or industrial disputes of a political motivated or regional nature or which impede movement of Goods) providing such delay occurs without the fault or negligence of ALSTOM.
10. Risk of Loss or Damage: ALSTOM shall have full risk of loss or damage to Work at all times prior to its delivery to the IPSC jobsite for off-loading from ALSTOM's carrier by IPSC. IPSC will assume all risk of loss or damage to the Work during off-loading and at all times thereafter, provided, that during any period that ALSTOM shall have sole care custody and control of the Work, ALSTOM shall assume risk of loss or damage to the Work, subject to its Limitations of Liability hereunder.
11. Existing Conditions: It is understood and agreed by the parties that nothing herein shall be interpreted as placing any responsibility or liability on:

## DIVISION D1

## SPECIAL CONDITIONS

- a. ALSTOM and affiliated companies for site or equipment conditions related to pollution, contamination, hazardous waste, asbestos, or toxic material, or for the generation, emission, or disposal of such substances; or
- b. IPSC for pollution, contamination, hazardous waste, asbestos, or toxic material introduced to the site or equipment by ALSTOM including the generation, emission, or disposal of such ALSTOM-introduced substances.

IPSC will protect and indemnify ALSTOM and affiliated companies against any and all claims or liabilities based on the conditions identified in paragraph a. above; and ALSTOM shall protect and indemnify IPSC against any and all claims or liabilities based on the conditions identified in paragraph b. above.

12. Proprietary Information: All information supplied by ALSTOM which is marked as "Proprietary" or "Confidential" shall be treated as the proprietary and confidential property of ALSTOM and shall be returned to ALSTOM upon request. IPSC will acquire no rights to ALSTOM's proprietary and confidential property. IPSC will not disclose such proprietary and confidential property to third parties or to employees who do not have a need-to-know, without the written authorization of ALSTOM and the execution of a nondisclosure agreement whose terms are consistent with those set forth herein. In no event may disclosures be made to competitors of ALSTOM. This clause shall survive the termination of this Contract and be in effect as long as IPSC has possession of any proprietary or confidential property of ALSTOM. If IPSC is legally compelled or otherwise required to make disclosure to governmental regulatory or similar types of agencies, IPSC will notify ALSTOM prior to making disclosure and take all available steps to limit the extent of such disclosure so as to minimize the release of such information. IPSC will use its best effort to obtain from the agencies to whom the information is disclosed, written agreement to maintain the confidentiality of such information; however, failure to obtain such written agreement shall not bar any release which is made in accordance with the requirements hereof provided that notification has been given and the amount of information so released is minimized.

This obligation of confidentiality shall not apply to any proprietary information which is (1) in the public domain at the time of disclosure or thereafter becomes part of the public domain by publication or otherwise, other than the failure of IPSC to meet its obligation hereunder; or (2) is in IPSC's possession prior to the disclosure as shown by written record; or (3) after it has lawfully been obtained by IPSC on a nonconfidential basis from other sources having legally obtained such information.

13. Aggregate Liquidated Damages Cap: In no event shall the total of liquidated damages for failure of the performance and delivery guarantees exceed fifty (50) percent of each unit's contract price.



**PART D - DIVISION D2****DETAILED SPECIFICATIONS - TECHNICAL REQUIREMENTS**

1. General: This specification provides technical information required for providing both products and services associated with supply of High-Pressure (HP) turbine inner cylinder sections, overhaul of Intermediate-Pressure (IP) turbine, internal alignment of these two (2) sections, and technical direction for effectively completing all turbine Work scheduled for both the March 2002 Unit 2 and the March 2003 Unit 1 outages at the Intermountain Power Project.
2. Unit Description: IPSC consists of two (2) sister units operating S-2, triple tandem-compound, single reheat, twenty- (20-) stage, impulse-type turbines with a double-flow nozzle. The existing HP turbine is a partial arc design with seven (7) stages including one (1) fourth stage extraction, second stage rotor cooling, and first stage pressure tap. The turbine is controlled via Mark II series electro hydraulic system.

The turbines have been increased in nominal output rating from an original installation output of 840 megawatts gross to a current rating of 875 megawatts gross.

3. Scope of Work: The IPSC planned scope of Work for the turbine generator during the Unit 2 outage beginning March 2, 2002, and the Unit 1 outage beginning March 1, 2003 is:
  - a. Replacement of the HP turbine inner cylinder section.
  - b. Inspection and overhaul of the IP turbine section.
  - c. Testing and possible disassembly of the generator for repair of stator winding leaks.
  - d. Inspection and overhaul of main stop, control, combined reheat, and ventilator valves.
  - e. Overhaul of servos, switches, and PMG at front standard.

The above scope of Work is scheduled for each unit at IPSC during their respective outages.

4. Scope of Supply: This section includes the following hardware and services to be provided by ALSTOM Power:
  - a. Design, manufacture, shop testing, and delivery of a new, high-efficiency HP turbine inner cylinder section, including any required special tools. HP turbines to be designed and provided with retractable packing as indicated in Division A1, Schedule of Pricing, Page A1-1 and A1-2. The new HP turbine inner cylinder module comprises the following hardware:



## DIVISION D2

TECHNICAL REQUIREMENTS

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- HP inner casing shell with integral HP exhaust difusser.
- Four (4) welded inlet pipe connections with piston ring seals and stellited liners (fitted into existing outer casing inkjet at site).
- Fully bladed HP rotor with eight (8) stages of advanced rotating blading with forked-pinned root fastenings and integral tip shrouds .
- Eight (8) HP fixed blade diaphragms incorporated advanced 3-D fixed blade profiles with retractable packing seals at the hubs on Stages 2-8 and extension rings supporting stationary rotating blade tip seals.
- Inlet (balance) gland casing with spring-backed sealing rings and incorporating inlet flow guide.
- Two (2) locating rings with packers for locating anti-rotation keys in outer casing.
- Interspace baffle ring with axial adjustment.
- One (1) set of replacement sleeves, including two spares, for the existing Ovako hydraulically expanded coupling bolts on the HP to IP rotor coupling.
- Miscellaneous shims and packers.
- Special tooling required for new equipment (e.g., lifting equipment for fully assembled module, inner cylinder guide pillars, bolt extension measurement equipment).
- Transportation cradle for the assembled inner cylinder module.
- Operation and maintenance manuals for equipment supplied.
- Assembly drawings, interface drawings, and thermal kit revisions linked to specific equipment supplied.

The HP turbine retrofit proposal is based on the reuse of the existing HP outer casing shell and shaft end gland seals on the assumption that all of these items are in an acceptable condition. Repair or replacement of these items and other interfacing components (e.g., bearing liners, shaft end gland seals, turbovisory detectors) is not included in the scope of supply.





## DIVISION D2

## TECHNICAL REQUIREMENTS

Special tooling supplied under this Contract does not include for tools used in conjunction with the existing HP turbine. The existing equipment tooling (e.g., transformer kit for bolt tightening, bolt heating elements, lifting beams and slings, lifting slings for small items, wrenches for joint bolts, torque wrenches, etc.) remains available for use during the installation of the new HP turbine equipment and for future maintenance. The new cylinder half joint bolts will be designed to use the existing bolt heaters, and bolt heads are designed for standard US wrenches.

All the minor machining operations required for installation purposes are carried out by the installation contractor and are not included in the scope of supply. Replacement thermal insulation is not included in the scope of supply.

- b. Field engineering services for on-site direction during installation of the new HP turbine inner cylinder section, overhaul of the IP section, overhaul of control, stop, and combined reheat valves, overhaul of front standard servos, and instrumentation testing, and operation of the completed turbine as listed in Section 6.

Field engineering services for on-site direction during the overhaul of the IP section, overhaul of control, stop, and combined reheat valves, overhaul of front standard servos and instrumentation testing, and operation of the completed turbine as listed in Section 6. Subject to agreement between ALSTOM and IPSC regarding manpower and any additional charges.

- c. Field direction of electro hydraulic control system modifications for optimized valve operation including parts as required for the modification.
- d. Internal alignment services for the IP turbines.
- e. On-site training for complete HP-IP overhaul/retrofit. Training agenda to be prepared based on a one (1) week, forty- (40-) hour schedule. Training to cover all aspects of overhaul including alignment for approximately thirty (30) people.
- f. Any reverse or interface system engineering required for successful design and installation of the retrofit HP turbine.

- 5. Design Conditions and Criteria: The justification for this project rests on both performance and output. Therefore, all reasonable effort shall be made to identify and incorporate the most current and proven performance related technologies.



## DIVISION D2

TECHNICAL REQUIREMENTS

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IPSC understands that by design, the new, high-efficiency HP turbine sections are unable to provide both partial-arc and full-arc operational modes. Accordingly, IPSC chooses to specify a full-arc operational design to take advantage of upper end operating efficiencies.

As a part of the modification to exclusive, full-arc control, ALSTOM shall provide required hardware and technical support for modifying existing valve operation. ALSTOM shall ensure that valve control, unit stability, and generation flexibility are not restricted, encumbered, or complicated beyond current capabilities.

The HP section shall be designed for the following throttle conditions and flow passing capability at VWO:

- a. 2400 psi.
- b. 1000° F.
- c. 6,900,000 lbs/hr.
- d. Three (3) percent pressure drop: HP valve inlet to HP turbine inlet.

The 1997 IFC Steam Tables shall be the exclusive reference used for calculation of HP section efficiency. The guaranteed HP turbine efficiency shall be 92.2 percent including valves.

All the HP turbine retrofit components will be made from materials procured to ALSTOM Power Purchase specifications which have been developed specifically for application on large steam turbines. In general, the materials of the major components will have compositions and mechanical properties which correspond closely to the approximate equivalent AISI/ASTM materials. Comparisons of ALSTOM Power material specifications and equivalent AISI/ASTM material specifications will be provided under the Contract.

The HP section steam path components shall be designed with a plasma-nitride, erosion-resistant treatment package. Specific type and application location information shall be provided to IPSC with Contract documentation.

ALSTOM shall be solely responsible for ensuring that all piping penetrations, instrument taps/wells, interfacing keys and supports, journals, couplings, snout sections, seals, etc., are properly located and sized.

Maximum allowable vibration in any plane in the fully assembled and operating turbine shall be in accordance with ISO 7919-2 Zone A requirements for 3600 RPM equipment.

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## TECHNICAL REQUIREMENTS

The HP turbine sections provided for installation on Unit 1 and Unit 2 shall be operationally interchangeable in every regard.

6. Field Service Engineering: The Field Service Engineer shall arrive on site no later than two (2) weeks prior to the respective outage scheduled start dates. The Field Service Engineer shall be available in accordance with the planned outage shift schedule, from two (2) weeks prior to the outage scheduled start date, until released by IPSC following successful startup and operation of the turbine. The construction supervisors shall arrive at the site no later than three (3) days prior to the start of the outage.

As part of this Contract, ALSTOM shall also provide general engineering advice and revised cycle data to allow assessment of the impact of the HP turbine retrofit on interfacing cycle components by IPSC at the new rated operating conditions. These engineering evaluations shall include boiler input/output requirements, IP and LP turbine impacts, as well as generator cooling requirements. ALSTOM shall make specific engineering evaluations of the following systems to ensure reliable operation of the new HP turbine section:

- a. Gland steam sealing system.
- b. Turbine drain system.
- c. Lubricating oil system.
- d. Governor and control system.
- e. Instrumentation and protection systems.

A minimum of two (2) qualified construction supervisors shall be provided, one (1) for the day shift and one (1) for the night shift. One (1) Field Service Engineer shall also be provided for technical direction throughout the outage. These three (3) individuals, together, shall perform the following functions:

- a. Technical direction to IPSC for disassembly, cleaning, inspection, repair, part replacement, reassembly, rotor alignment, balancing, etc., of the steam turbine-generator components and section identified within Section 3, Scope of Work.
- b. Assist IPSC with overhaul planning, schedule preparation, and schedule updating.
- c. Prepare and submit to IPSC a technical report which details the inspections, repairs, and future recommendations related to the Work done on the turbine.

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## TECHNICAL REQUIREMENTS

The field service personnel shall have had formal training for field construction and technical support on large, impulse design, steam turbines. These individuals shall have at least ten (10) years of field construction or engineering experience in their respective job functions in installation, repair, and operation of these type machines.

At least six (6) weeks prior to the outage, the Field Service Engineer and one (1) construction supervisor shall come to the site and participate in a finalization planning meeting for the Retrofit Outage.

7. Internal Alignment Services: ALSTOM shall provide labor, supervision, expertise, tools, and equipment for full internal alignment of the IP section of the turbine. Where laser alignment technology is employed, ALSTOM or its subcontractor shall test all equipment at ALSTOM or its subcontractor's shop prior to mobilizing to the site to prevent downtime due to faulty equipment.

ALSTOM shall provide adequate numbers of trained personnel in order to judiciously pursue completion of the internal alignment, without interruption, within the scheduled alignment window.

ALSTOM/subcontractor alignment personnel shall be responsible for obtaining alignment data, advising IPSC personnel as to required moves, and assuring that IPSC personnel have achieved the moves as requested. The physical work of adjustments will be carried out by IPSC staff, not by ALSTOM/Laser alignment personnel.

Alignment personnel must be able to effectively coordinate all alignment information with the applicable turbine supervisors, repair/supporting contractors, and assigned engineers at the site, regardless of corporate affiliation.

Personnel conducting turbine internal alignment Work shall be trained and qualified in the procedures used and in operation of the equipment required for the Work. The personnel shall have performed the same Work on at least ten (10) previous occasions, and at least five (5) of those on large, impulse design steam turbines.

8. IPSC Provided Facilities: IPSC will provide two (2) desks in an enclosed office trailer on the turbine deck for the Field Service Engineer to use. The trailer will also be occupied by IPSC personnel.

IPSC will provide a single telephone line in the office trailer for use by the Field Service Engineer.

IPSC will provide access to a fax and copy machine for use by the Field Service Engineer.

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## DIVISION D2

## TECHNICAL REQUIREMENTS

9. Reference Drawings: These drawings are provided as references on which the initial ALSTOM offering and guarantees were based.

- Figure 1 - Unit 1, Benchmark Test Heat Balance.
- Figure 2 - Unit 2, Benchmark Test Heat Balance.
- Figure 3 - Unit 1, Operating Heat Balance.
- Figure 4 - Unit 2, Operating Heat Balance.

The final ALSTOM guarantees are based on Figure 5 (Unit 1) and Figure 6 (Unit 2), which also show the definition of HP efficiency and give the HP wheel section power for information.

10. Operating Experience: For ALSTOM's information only, IPSC has operated for the past five (5) to six (6) years with net capacity and availability factors in excess of 90 percent, with net output in excess of 95 percent.

Weekly valve and yearly tightness and over speed testing have been successfully completed since original installation.

Turbine startups have been relatively smooth on both units. Only rarely is a balance shot required during startup.

A Load Profile (Figure 5), typical of recent years is enclosed for your information.

11. Maintenance History and Provisions: The IPSC turbines were overhauled completely by the OEM approximately two (2) years after start of commercial operation. Since that time, all maintenance on the turbines has been performed by IPSC personnel under the direction of a Field Service Engineer.

Turbine oil is monitored by on-site predictive maintenance personnel who are fully trained in ferrographic, particulate, and inductively coupling plasma analysis. The turbine oil was recently replaced on both units as the oil additive packages were showing signs of degradation affecting the oil/moisture separation properties; however, moisture has remained continually within allowable limits.

IPSC is aware of no dimensions affecting the installation of a new HP that have been modified since installation. The only significant modifications to the turbine since startup are as follows:

- a. Hydraulic Coupling Bolts, Ovako, Inc.
- b. Retractable Packing, Turbocare, Inc.

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## TECHNICAL REQUIREMENTS

12. Manufacturing Schedule: Within six (6) weeks of Contract award, ALSTOM shall submit a detailed schedule showing all facets of completion for the HP turbine section and associated components. The schedule shall include:
- a. Order placement for material stock for each major component.
  - b. Expected delivery to manufacturing facilities of stock for each major component.
  - c. Start of material acceptance testing for each major component.
  - d. Start of manufacture of each major component.
  - e. Start of shop testing for each major component.
  - f. Start of component subassembly (i.e., rotor assembly, diaphragm assembly, etc.)
  - g. Start of subassembly testing (i.e., rotor testing, diaphragm NDE, and final dimensions).
  - h. Start of assembly (alignment, etc.).
  - i. Final assembly dimensional verification.

Updated manufacturing progress reports shall be prepared and submitted to IPSC on a monthly basis starting the first month after Contract award and continuing up to the date of final inspection and shipment. ALSTOM shall give IPSC thirty (30) days advance notice of testing designated with an "N" on the Summary of Quality Control Actions table (enclosed).

13. Drawings to be Supplied Under this Contract Comprise:
- a. Interface drawings.
  - b. Modifications to existing components at interfaces.
  - c. Assembly drawings.
  - d. Rotor clearance drawings.
  - e. Diaphragm alignment drawings.
  - f. Lifting drawings.
  - g. "As-made" modifications to any of the above drawings.
14. HP Section Performance Testing: Initial HP section efficiency/HP wheel power output or HP swallowing capacity testing shall occur as soon after the outage as reasonably possible. The initial guarantee performance verification test for HP section efficiency and HP swallowing capacity will be carried out as soon as practicable after the unit is

## DIVISION D2

## TECHNICAL REQUIREMENTS

restarted following the retrofit installation. IPSC anticipates the ability to complete the initial testing within one (1) to two (2) weeks of startup; however, several factors could develop that could delay the test. These factors include an inability to achieve stable or acceptable turbine vibration limits, lack of permission from dispatch authority, unforeseen load demands, or problems with other plant equipment. In addition to initial performance testing, IPSC will complete an identical confirmation test approximately thirty (30) days following initial performance testing. Performance incentives/penalties shall be calculated and awarded based on the average of the initial performance test results and the thirty- (30-) day confirmation test results, both completed within a maximum of eight (8) weeks of restarting the units.

In order to monitor any abnormal efficiency deterioration, benchmark enthalpy-drop tests will be taken periodically from the time of initial loading of the turbine and the results recorded for reference purposes. If any excessive deterioration is observed (over and above that which would be expected from reference to the ASME PTC 6 Report 1985 Report - see below) a testing allowance equal to the difference between the measured deterioration and the ASME guidance norm will be applied. Similarly, if the tests are delayed beyond the recommended eight (8) weeks after resynchronization, an agreed deterioration allowance will be applied to the results.

Guidance on test delay given in the ASME PTC 6 Report 1985 Report (Section 3.06 - Timing of Tests - Fig. 3.3) is based on industry experience representing average expected deterioration for units with a history of good operating procedures and water chemistry. The guidance given for heat rate deterioration is built up from enthalpy-drop tests on a number of turbines. For turbine configurations of the same type as Intermountain, the HP turbine may be taken to account for approximately 50 percent of the total degradation.

ALSTOM is invited to be present during all testing. IPSC will apply best effort to confer with ALSTOM regarding all issues that may affect the evaluated performance of the turbine.

IPSC will prepare a specification and engage a qualified contractor for the performance tests. For general information, the following criteria will form the basis of the performance testing:

- a. The unit shall be operated at steady state, full load for approximately one (1) hour prior to start of test.
- b. Steady state shall be defined as fluctuations of not greater than:
  - (1) 0.25 percent of absolute pressure readings.
  - (2) 7.0° F temperature readings.

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- c. Test shall consist of a minimum sixty- (60-) minute test, with readings taken a minimum of every two (2) minutes.

All readings shall be taken from at least two (2) parallel points allowing for direct indication of faulty equipment. Both elements shall be monitored and recorded during the equalization period and throughout the performance test for increased accuracy.

All testing instrumentation shall be calibrated and traceable to the National Bureau of Standards. Instrumentation shall be calibrated both before and after testing is complete.

The cost of one (1) initial HP section efficiency/HP section wheel power output test or HP swallowing capacity test following the outage and one (1) identical confirmation test approximately thirty (30) days subsequent, will be borne by IPSC. All testing shall be considered valid and contractually binding if the HP section efficiency or the HP section wheel power output is tested to be no more than 2.0 percentage points below guaranteed efficiency.

Should excessive performance degradation between the initial performance test and the confirmation test occur, guidelines from ASME PTC 6 1985 Report shall be applied.

If the measured section efficiency during either the initial HP section efficiency/HP section wheel power output test or the identical thirty (30) day confirmation test is more than 2.0 percentage points below guaranteed, an additional test shall be run and paid for by IPSC, as soon after the first test as operationally reasonable.

If the initial and confirmatory tests are within the 2.0 percent window, the testing results shall be considered valid and contractually binding. If an additional second test is necessary and the additional second test is outside (below) the 2.0 percent window, testing results from all of the first and second performance tests shall be averaged to produce the valid and contractually binding HP section performance.

HP section efficiency shall be defined as measured across both the valves and the HP section from throttle conditions to the HP section exhaust.

Prior to assessing penalties or incentives, HP section power output efficiency and HP swallowing capacity shall be corrected for variations in specified terminal conditions using correction factors agreed in advance of the tests.

15. Contract Document Submittals: During the course of fabrication of the HP section, ALSTOM shall submit the following information in accordance with the monthly updated manufacturing schedules and reports outlined in Section 12 of this Division. As-built or updated revisions shall be prepared and submitted following installation of each respective HP inner cylinder section.



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- a. A revised thermal kit based on the specific throttle conditions.
  - b. Ongoing Q/A reports as specified in the Summary of Quality Control Actions Table as referred to in Division D2, Section 12.
  - c. Mill certificates.
  - d. Manufacturing progress reports.
  - e. Rotor balance report including static unbalance at critical speeds and rated speed.
  - f. Rotor run-out report.
  - g. Calculated rotor torsional characteristics (sufficient to demonstrate that the new HP rotor has negligible impact on the shaft line torsional characteristics).
  - h. Assembly and interface drawings.
  - i. Component and assembly rigging plan including accurate weight of each lift.
  - j. Piping connection and instrumentation port location drawings.
  - k. Within thirty (30) days after award of Contract, ALSTOM shall submit a schedule of submittals including all drawings by title and their estimated submittal and approval return dates.
  - l. Itemized list of each major component showing design weight.
  - m. Steam seal clearance diagrams.
  - n. Steam path dimensions and tolerances for eventual repair of internal components.
16. Existing HP Section Availability: The existing Unit 1 HP turbine at IPSC is currently scheduled to be available for inspection, measurement, and condition assessment during the upcoming outage beginning March 5, 2001. During this outage, the following items on the turbine will be disassembled for inspection:
- a. Top half outer casing removed.
  - b. Top half N1 gland casing removed.

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- c. First and second pedestals opened and bearing top halves removed.
- d. One (1) gland ring removed from N1 and N2 at each diameter for Pi tape measurements.

ALSTOM shall have up to four (4) days of access for inspection of the HP turbine on Unit 1. **The HP turbine inner casing will not be open. The extraction lines will not be severed or unbolted.**

17. Shipping: All components and assemblies shall be packaged, coated, supported, and secured to prevent corrosion, damage, or deformation during shipping. Any damage sustained prior to delivery to the IPSC facility shall be judiciously corrected by and to the account of ALSTOM.

Bearing journals areas shall be securely covered and protected by treated cotton cloth or acceptable equal to prevent inadvertent contact or corrosive elements.

18. Maintenance Manuals: ALSTOM shall provide ten (10) sets of maintenance manuals at time of delivery, including the following information applicable to ALSTOM's scope of supply:

- a. Detailed overhaul recommendations.
- b. General arrangement drawings.
- c. Rotor clearance drawings.
- d. Diaphragm alignment drawings.
- e. Longitudinal X-section elevation.
- f. Shaft torque characteristic plot.

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## APPENDIX 1

### MATERIAL COMPOSITIONS & PROPERTIES

#### ALSTOM POWER HP TURBINE MATERIALS

Forgings for HP rotor	SBV M11001
Bar for HP rotating blades	SBV M13001
Bar for HP fixed blades	SBV M13015
Casting for HP Inner shell	SBV M15004
Plate for diaphragm rims and centers	SBV M16001

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## Forgings for HP Rotors

### Chemical composition

	ALSTOM POWER 1%CrMoV steel	ASTM A470 Class 8
C	0.22 - 0.28	0.25 - 0.35
Si	0.30 max	0.15 - 0.35
Mn	0.60 - 0.85	1.00 max
S	0.015 max	0.015 max
P	0.015 max	0.012 max
Ni	0.40 - 0.80	0.75 max
Cr	0.70 - 1.00	1.05 - 1.50
Mo	0.70 - 0.90	1.00 - 1.50
V	0.30 - 0.36	0.20 - 0.30
Cu	0.15 max	-
Sn	0.015 max	-
As	0.025 max	-
Sb	0.005 max	For information
Al	0.010 max	-

### Melting Route

Electric furnace process  
and  
vacuum treated

Electric furnace process  
and  
vacuum treated

### Mechanical Properties at periphery of forging

Tensile strength  
minimum,  
N/mm<sup>2</sup> (ksi)  
0.2% Proof strength  
minimum, N/mm<sup>2</sup> (ksi)  
Elongation minimum, (%)  
Longitudinal(L<sub>0</sub>=5.65S<sub>0</sub>)

695 (101)

725 - 860 (105 - 125)

570 (83)

620 (90)

14

17

40

43

Reduction in area,  
minimum (%)

20 at 20°C

8.2

Charpy V-notch impact  
energy, minimum, (J)

20 at 40°C

Longitudinal

+100°C

+121°C

Transverse

>1,000 hrs to reach 0.2%  
strain

not specified

FATT, maximum

Creep strain property

at 550°C

### Thermal stability test

GA specification  
Test performed at  
650°C.

ASTM A472

### NDE

Visual examination  
Magnetic particle  
examination  
Ultrasonic examination

All surfaces  
All locally ground surfaces  
Entire volume using  
compression wave probes  
and/or angle compression  
wave probes.

Optional  
Optional  
Examination from all  
surfaces to demonstrate  
freedom from detrimental  
internal indications, as  
practice A 418

## Forgings for HP Rotors (cont.)

Heat treatment:	<p>Heat treatment of the forgings is carried out to a practice agreed by ALSTOM POWER. It may vary from forge master to forge master in some details, but will always include a Preliminary Heat Treatment intended to refine the structure followed by a Quality Heat Treatment to further refine the structure for ultrasonic testing and to produce the required mechanical properties.</p> <p>Typically, Preliminary Heat Treatment comprises austenitising and tempering. For the Quality Heat Treatment, solution treatment is carried out in the range 960 to 975°C for a minimum of 8 hours followed by oil quenching.</p> <p>A tempering treatment is subsequently carried out at in the range 690-710°C for a time dependent on the forging size. This treatment is designed to produce an optimum distribution of creep strengthening alloy carbides.</p> <p>After completion of rough machining each forging is subject to a thermal stability test to confirm its dimensional stability.</p>
Microstructure:	<p>The 1%CrMoV forgings are bainitic. Modern steelmaking practice for large rotor forgings results in low sulphur values leading to fewer sulphide inclusions than are found in older forgings.</p>
FATT:	<p>FATT is determined after completion of Quality Heat Treatment at the forge master.</p>
Creep	<p>The creep strength of each forging is established against a benchmark standard to ensure that the forging has acceptable long term high temperature properties.</p>
Weld repair:	<p>No weld repair is permitted.</p>
NDT:	<p>100% of the volume of each forging is examined using normal compression wave probes and/or angle compression wave probes. In addition blade attachment zones are further examined using twin crystal probes.</p>

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## Bar for HP Rotating Blades

### Chemical composition

#### ALSTOM POWER 11%CrMoVNbN steel

#### AISI Type 422 ASTM A565 Gr 616 Condition HT

C	0.16 - 0.23	0.20 - 0.25
Si	0.10 - 0.50	0.10 - 0.50
Mn	0.30 - 0.80	0.50 - 1.00
S	0.015 max	0.025 max
P	0.025 max	0.025 max
Ni	0.30 - 0.60	0.50 - 1.00
Cr	10.00 - 11.50	11.0 - 12.5
Mo	0.50 - 0.80	0.90 - 1.25
V	0.10 - 0.30	0.20 - 0.30
Nb	0.30 - 0.60	-
N	0.050 - 0.100	-
Al	0.020 max	-
B	0.005 max	-
W	-	0.90 - 1.25

### Mechanical Properties

Tensile strength, N/mm <sup>2</sup> (ksi)	880 - 1030 (128 - 149)	965 (140) min
0.2% Proof strength minimum, N/mm <sup>2</sup> (ksi)	750 (109)	760 (110)
Elongation, minimum(%)	12	13
Reduction in area, minimum (%)	40	30
Charpy V-notch impact energy, minimum, (J)	20	11
Brinell Hardness	262 - 311	302 - 352

### NDE

Magnetic particle examination	Whole length of all bars at finished bar stage	Not specified
Ultrasonic examination	All bars at either billet or finished bar stage	Not specified

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## Bar for Rotating Blades (cont.)

The material is the standard European high temperature blading steel and has an excellent service record spanning more than 30 years.

The stress rupture strength of this grade (also recognizable as DIN X19 CrMoVNbN 11-1) is at least as good as that of grade AISI Type 422.

Blades are machined from bar which receives a forging reduction from the ingot of 38:1.

### Heat treatment:

The material is solution treated at a temperature between 1100 and 1150°C for ½ hour minimum, followed by quenching in oil or air. A tempering treatment in the range 680-720°C for 4 hours minimum is followed by cooling to room temperature. If any bar material requires straightening after the Quality Heat Treatment, the whole batch is stress relieved following the straightening operation in the range 640-720°C for 2 hours minimum. Mechanical tests are carried out after completion of all heat treatment.

### Mechanical tests:

The hardest and softest bar in each heat treated batch is mechanically tested, and micro structurally examined.

### Microstructure fully

The microstructure is established on the broken tensile test piece; it is martensitic with a requirement that the delta ferrite content is less than 5%.

### NDT:

All bar for blading is ultrasonically tested and MPI'd by the supplier.



## Bar for HP Fixed Blades

### Chemical composition

### ALSTOM POWER 12%CrMo

### ASTM A276 (Type 403)

C	0.09 - 0.13	0.15 max
Si	0.15 - 0.50	0.50 max
Mn	0.30 - 0.70	1.00 max
S	0.015 max	0.030 max
P	0.025 max	0.040 max
Ni	0.60 max	-
Cr	11.50 - 13.00	11.50 - 13.00
Mo	0.40 - 0.80	-
V	0.10 max	-

### Mechanical Properties

Tensile strength, N/mm <sup>2</sup> (ksi)	695 - 850(101 - 123)	690 min (100 min)
0.2% Proof strength minimum, N/mm <sup>2</sup> (ksi)	540 (78)	550 (80)
Elongation, minimum(%) L <sub>o</sub> =5d	18	15
Reduction of area, minimum (%)	50	45
Charpy V notch impact energy, minimum, (J)	50 at 20°C	-
Brinell Hardness	207 - 255	-

### NDE

Magnetic particle examination	Whole length of bars	Not specified
Ultrasonic examination	All bars either at billet or finished bar stage	Not specified



## Casting for HP Inner Cylinder

### Chemical composition

#### ALSTOM POWER 1¼%CrMoV steel

#### ASTM A356M Grade 9

C	0.15 - 0.20	0.20 max
Si	0.30 - 0.50	0.20 - 0.60
Mn	0.50 - 0.80	0.50 - 0.90
S	0.025 max	0.030 max
P	0.025 max	0.035 max
Ni	0.50 max	0.20 - 0.35
Cr	1.00 - 1.50	1.00 - 1.50
Mo	0.90 - 1.15	0.90 - 1.20
V	0.20 - 0.30	0.20 - 0.35
Al	0.030 max	

### Mechanical Properties

Tensile strength, N/mm <sup>2</sup> (ksi)	590 - 780 (85 - 113)	585 (85) min
0.2% Proof strength minimum, N/mm <sup>2</sup> (ksi)	440 (64)	415 (60)
Elongation, minimum (%) L <sub>o</sub> =5.65ÖS <sub>o</sub> L <sub>o</sub> =50mm	15	15
Reduction in area, minimum (%)	35	45
Charpy V-notch impact energy, minimum, (J)	24	-
Brinell Hardness	170 - 235	-

### NDE

Magnetic particle examination	All accessible surfaces	If specified
Ultrasonic examination	Overall	Not specified
Radiographic examination	If specified	If specified

### **Casting for HP Inner Cylinder (cont.)**

- Heat treatment:** The casting is solution treated in the range 920 to 960°C for 5 hours minimum followed by quenching in oil. A tempering treatment in the range 700-740°C for 5 hours minimum is followed by furnace cooling.
- NDT:** The whole of the casting is examined ultrasonically using normal compression and angle compression wave probes according to an agreed scanning plan. All accessible surfaces of the casting are magnetic particle inspected.
- Weld repair:** Any areas requiring weld repair are excavated and re-magnetic particle inspected. Repair is carried out using a matching 1CrMoV or 2CrMo filler wire, with composition according to a recognized international standard. Post weld heat treatment is carried out in a furnace with contact thermocouples, at a temperature in the range 700-740°C.
- Re-NDT:** Following weld repair, the entire casting is magnetic particle inspected and repair areas ultrasonically tested.
- Mechanical properties:** Mechanical tests are carried out on integrally cast test blocks suitably distributed and attached to the casting through all stages of heat treatment to establish the properties described overleaf.

## Plate for Diaphragm Rims and Centers

### Chemical composition

### ALSTOM POWER ½%CrMoV steel

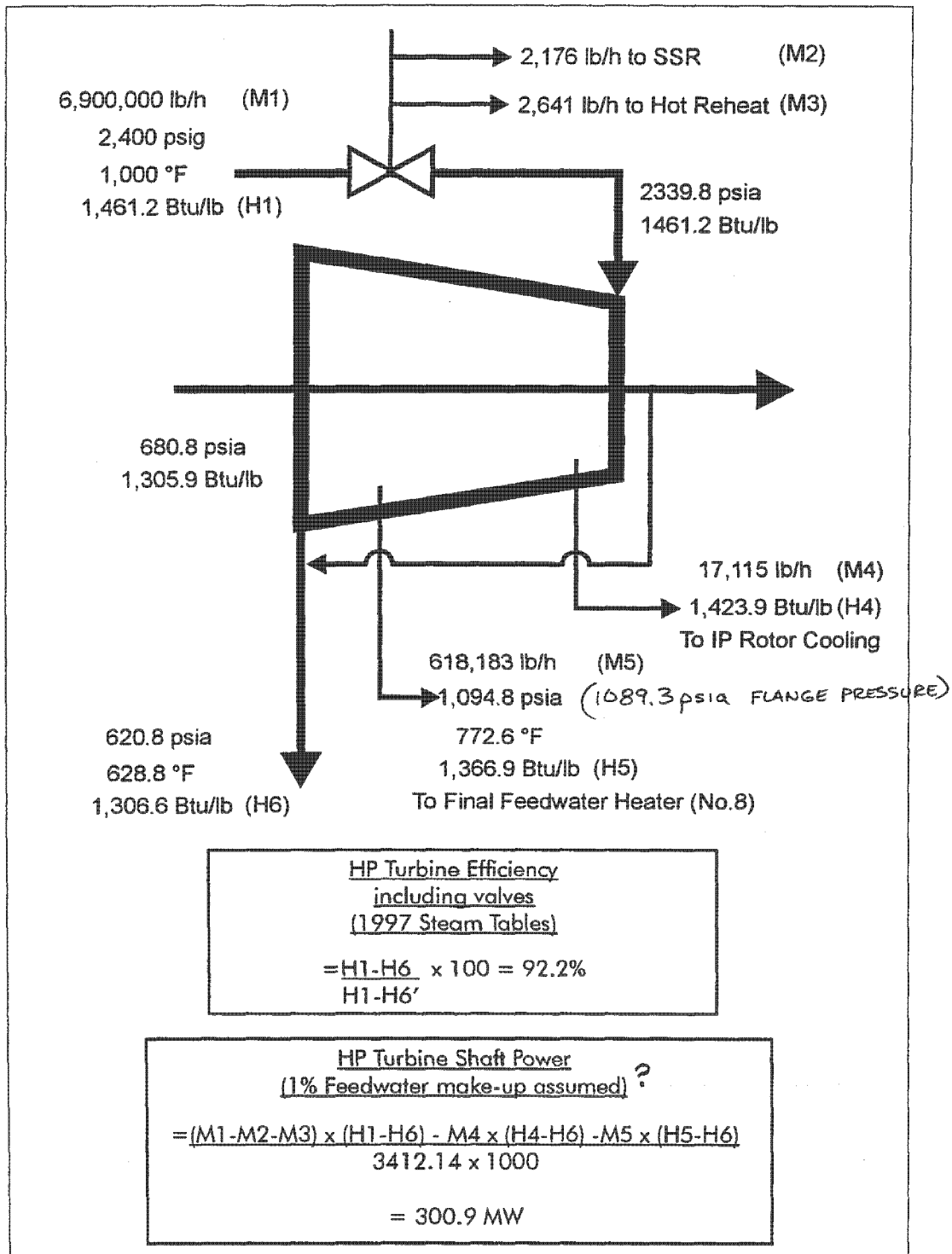
C	0.08 - 0.13
Si	0.30 max
Mn	0.60 - 1.00
S	0.015 max
P	0.025 max
Ni	0.30 max
Cr	0.25 - 0.50
Mo	0.50 - 0.70
V	0.22 - 0.28
Cu	0.20 max
Al	0.020 max

### Mechanical Properties

Tensile strength, N/mm <sup>2</sup> (ksi)	460 - 610 (67 - 88)
0.2% Proof strength minimum, N/mm <sup>2</sup> (ksi)	310 (45)
Elongation, minimum (%) L <sub>o</sub> =5.65ÖS <sub>o</sub>	20
Charpy V-notch impact energy, minimum, (J)	30
Brinell Hardness	131 -179

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**Figure 6 – Unit 1 HP Power and Efficiency**



What is equivalent HP Swallowing Capacity?

2

**Figure 7 – Unit 2 HP Power and Efficiency**

